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EXAMINER

WILLS, DIANE M

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ROBERT SUMNER, STELIAN COROS, SEBASTIAN MARTIN,
and BERNHARD THOMASZEWSKI

Appeal 2017-002616^{1, 2}
Application 13/953,516
Technology Center 2600

Before JAMES R. HUGHES, CARL L. SILVERMAN, and
ALEX S. YAP, *Administrative Patent Judges*.

HUGHES, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants seek our review under 35 U.S.C. § 134(a) of the
Examiner's Final Rejection of claims 1–20, which constitute all the claims

¹ According to Appellants, the real party in interest is Disney Enterprises, Inc. App. Br. 3.

² The application on appeal has an effective filing date of July 29, 2013, and has no parent applications. Therefore, the Leahy-Smith America Invents Act (AIA) amendments to the U.S. Code (§§ 102, 103) are applicable. *See* MPEP § 2159.02: "AIA 35 U.S.C. 102 and 103 took effect on March 16, 2013. AIA 35 U.S.C. 102 and 103 apply to any patent application that contains or contained at any time a claim to a claimed invention that has an effective filing date that is on or after March 16, 2013."

pending in this application. Final Act. 1–2; App. Br. 1, 5.³ We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

Appellants’ Invention

The invention generally concerns computer-based animation and motion control of deformable objects, including computer-readable storage media, systems, and methods of animating a deformable object. The method includes retrieving a geometric mesh of vertices for a first rest state configuration of the deformable object, retrieving a desired motion of the deformable object and determining a function for the desired motion of the deformable object; and determining a second rest state configuration of the deformable object by adjusting the position of one or more vertices of the mesh based on the function, wherein the rest state configurations of the deformable object are parameterized such that the rest state configurations are generated based on an initial rest state configuration of the deformable object, displacements of a reduced set of controllable mesh vertices, and a linear map between changes in rest state coordinates and the displacements of the reduced set of controllable mesh vertices. Spec. ¶¶ 1, 5, 49–50; Abstract.

³ We refer to Appellants’ Specification (“Spec.”) filed July 29, 2013, Appeal Brief (“App. Br.”) filed June 27, 2016, and Reply Brief (“Reply Br.”) filed Dec. 5, 2016. We also refer to the Examiner’s Answer (“Ans.”) mailed Oct. 5, 2016, and Final Office Action (Final Rejection) (“Final Act.”) mailed Jan. 26, 2016.

Representative Claim

Independent claim 1, reproduced below with key disputed limitations emphasized, further illustrates the invention:

1. A method of animating a deformable object, the method comprising:

retrieving a geometric mesh comprising a plurality of vertices related to a first rest state configuration corresponding to the deformable object;

retrieving a motion goal associated with the deformable object;

translating the motion goal into a function of one or more state variables associated with the deformable object;

computing a second rest state configuration corresponding to the deformable object by adjusting the position of at least one vertex in the plurality of vertices based at least in part on the function; and

rendering one or more image frames depicting the deformable object in at least one of the first and the second rest state configurations,

wherein rest state configurations of the deformable object are parameterized such that the rest state configurations are generated based on an initial rest state configuration of the deformable object, displacements of a reduced set of controllable mesh vertices, and a linear map between changes in rest state coordinates and the displacements of the reduced set of controllable mesh vertices.

Rejections on Appeal

1. The Examiner rejects claims 1, 3, 4, 11, 13, 14, and 20 under 35 U.S.C. § 103 as being unpatentable over Takashi Ijiri et al., *ProcDef: Local-to-global Deformation for Skeleton-free Character Animation*, 28 Comp. Graph. Forum, 1821–28 (2009) (“Ijiri”) and Irving et al. (US 2009/0306948 A1, published Dec. 10, 2009) (“Irving”).

2. The Examiner rejects claims 2 and 12 under 35 U.S.C. § 103 as being unpatentable over Ijiri, Irving, and Olga Sorkine & Marc Alexa, *As-Rigid-As-Possible Surface Modeling*, Proceedings of the Fifth Eurographics Symposium on Geometry Processing (2007) (“Sorkine”).

3. The Examiner rejects claims 5 and 15 under 35 U.S.C. § 103 as being unpatentable over Ijiri, Irving, and Alec Jacobson et al., *Bounded Biharmonic Weights for Real-Time Deformation*, 30 ACM Trans. Graph. (2011) (“Jacobson”).

4. The Examiner rejects claims 6, 7, 16, and 17 under 35 U.S.C. § 103 as being unpatentable over Ijiri, Irving, and Sebastian Martin et al., *Example-Based Elastic Materials*, 30 ACM Trans. Graph., 72:1–8 (2011) (“Martin”).

5. The Examiner rejects claims 8 and 18 under 35 U.S.C. § 103 as being unpatentable over Ijiri, Irving, Martin, and Shaoting Zhang et al., *Robust mesh editing using Laplacian coordinates*, 73 Graphical Models, 10–19 (2011) (“Zhang”).

6. The Examiner rejects claims 9 and 19 under 35 U.S.C. § 103 as being unpatentable over Ijiri, Irving, Stelian Coros et al., *Robust Task-based Control Policies for Physics-based Characters*, 28 ACM Trans. Graph., 170:01–09 (2009) (“Coros”), and Martin de Lasa et al., *Feature-Based Locomotion Controllers*, 29 ACM Trans. Graph. (2010) (“de Lasa”).

7. The Examiner rejects claim 10 under 35 U.S.C. § 103 as being unpatentable over Ijiri, Irving, and Hornbaker (US 2009/0204909 A1, published Aug. 13, 2009).

ISSUE

Based upon our review of the record, Appellants' contentions, and the Examiner's findings and conclusions, the issue before us follows:

Did the Examiner err in finding that the combination of Ijiri and Irving would have collectively taught or suggested:

wherein rest state configurations of the deformable object are parameterized such that the rest state configurations are generated based on an initial rest state configuration of the deformable object, displacements of a reduced set of controllable mesh vertices, and a linear map between changes in rest state coordinates and the displacements of the reduced set of controllable mesh vertices

within the meaning of Appellants' claim 1 and the commensurate limitations of Appellants' claims 11 and 20?

ANALYSIS

The 35 U.S.C. § 103 Rejections

The Examiner rejects independent claim 1 in view of Ijiri and Irving. *See* Final Act. 2–4; Ans. 2–4. Appellants contend that Ijiri and Irving do not teach the disputed features of claim 1. App. Br. 11–14; Reply Br. 2–5.⁴ Specifically, Appellants contend that Irving (in combination with Ijiri) does not teach or suggest

a linear mapping between changes in its rest state coordinates and displacements of its finite elements, i.e., a linear mapping relating how much rest state coordinates change to how much the

⁴ Appellants' Reply Brief contains incorrect page numbers. We cite to the Reply Brief as if the pages were properly numbered in sequential order (pages 1–8).

finite elements are displaced (e.g., a finite element displacement of 1 unit results in a rest state coordinate change of 2 units).

App. Br. 13; *see* App. Br. 11–14; Reply Br. 2–5. Appellants further explain that

the only “linear mapping” the Examiner cites from Irving is the linear mapping function that “transforms the initial rest state configuration of finite elements into the target rest state configuration,” with the Examiner suggesting that the claimed “reduced set of controllable mesh vertices” reads on such finite elements that are transformed between different rest state configurations. However, Irving’s linear mapping function is merely a **mapping between rest state configurations of finite elements (which are described as being internal structures associated with animation poses) that produces a change** from the initial to the final rest state configurations of the finite elements. By contrast, claims 1, 11, and 20 recite a linear map “between changes in rest state coordinates and the displacements of the reduced set of controllable mesh vertices,” which is a **mapping between two different changes**, namely the “changes in rest state coordinates” and the changes represented by the “displacements of the reduced set of controllable mesh vertices.”

Reply Br. 3.

We agree with Appellants that Irving merely describes, “at best[,] **a linear map between initial and target configurations of the ‘reduced set of controllable mesh vertices’**” (Reply Br. 3). *See* Final Act. 2–4; Ans. 2–4 (citing Irving ¶¶ 9, 23, 24). Therefore, we agree with Appellants that Irving does not teach the linear map as recited in claim 1.

Consequently, we are constrained by the record before us to find that the Examiner erred in concluding that Ijiri and Irving teach the disputed limitations of Appellants’ claim 1. Independent claims 11 and 20 include limitations of commensurate scope. Dependent claims 3, 4, 13, and 14

depend on claims 1 and 11, respectively. Accordingly, we reverse the Examiner's obviousness rejection of claims 1, 3, 4, 11, 13, 14, and 20.

With respect to the obviousness rejections of dependent claims 2 and 12 (rejected as obvious over Ijiri, Irving, and Sorkine), dependent claims 5 and 15 (rejected as obvious over Ijiri, Irving, and Jacobson), dependent claims 6, 7, 16, and 17 (rejected as obvious over Ijiri, Irving, and Martin), dependent claims 8 and 18 (rejected as obvious over Ijiri, Irving, Martin, and Zhang), dependent claims 9 and 19 (rejected as obvious over Ijiri, Irving, Coros, and de Lasa), and dependent claim 10 (rejected as obvious over Ijiri, Irving, and Hornbaker), we reverse the Examiner's obviousness rejections of these claims for the same reasons set forth with respect to claim 1 (*supra*). We note the Examiner does not present findings that the additional references cure the deficiencies of Ijiri and Irving (discussed *supra*).

CONCLUSION

Appellants have shown that the Examiner erred in rejecting claims 1–20 under 35 U.S.C. § 103.

DECISION

We reverse the Examiner's rejections of claims 1–20.

REVERSED